

**MOTOR-DRIVEN SWITCHES**  
**KS-5502 AND KS-15836 TYPE**  
**REPLACEMENT PARTS AND PROCEDURES**

**1. GENERAL**

**1.01** This section covers the information necessary for ordering parts to be used in the maintenance of the KS-5502 and KS-15836 type motor-driven switches. It also covers approved procedures for replacing these parts.

**1.02** This section is reissued to:

- Add new Fig. 2 and 6 showing snap action switches and plastic actuating cams.
- Revise Fig. 7.
- Revise 3.06
- Add a procedure for replacing cam switch drums (3.16).

**1.03** Part 2 of this section covers ordering information for those parts which it is practicable to replace in the field in the maintenance of these switches. No attempt should be made to replace parts not designated except small items such as screws. Part 2 also contains explanatory figures showing the different parts. This information is called Replacement Parts.

**1.04** Part 3 of this section covers the approved procedures for the replacement of the parts covered in Part 2. This information is called Replacement Procedures.

*Caution: Before doing any work on the switch, remove the motor and control circuit fuses on the associated plant control panel to remove voltage from the motor and motor control circuit. Remount the fuses when the work is completed.*

**2. REPLACEMENT PARTS**

**2.01** The figures included in this part show the various replacement parts, with their corresponding names, in their proper relation to other parts of the apparatus.

**2.02** When ordering a replacement part, give the name of the part and the complete nameplate data of the switch, including the KS number, list number, manufacturer's name and serial number. When ordering a replacement part for the motor, also give the complete nameplate data of the motor. For example: Field Coils for Master Gearmotor, Serial DQ 8343, Style-258332, Type-DM, Frame 5212RW, H.P.-1/8, Volts-25DC, Phase or Winding-Shunt, RPM-2850, Amps-9.2, CO Shaft RPM-78, Temp Rating Cont-50°C, Master Electric Co; for KS-15836 L3 Switch, Anderson Power Products Inc. Serial 634272.

**2.03** Information enclosed by parentheses ( ) is not ordering information. This information may be references to notes, parts referred to in other portions of the section and not considered replaceable, or part names in general use in the field if these names differ from those assigned by the manufacturer.

**3. REPLACEMENT PROCEDURES****3.01 List of Tools and Materials**

CODE OR SPEC NO.	DESCRIPTION
<b>TOOLS</b>	
207	90 Degrees Offset Screwdriver
KS-6320	Orange Stick
KS-14220 L1	Sliding Tee Handle
KS-14220 L4	9-Inch Long Extension Bar
KS-14220 L5	Universal Joint
KS-14220 L11	11/32-Inch Socket Wrench
KS-14220 L12	3/8-Inch Socket Wrench
→KS-14220 L14	7/16-Inch Socket Wrench
KS-14220 L16	1/2-Inch Socket Wrench
KS-14220 L20	5/8-Inch Socket Wrench
R-1542	Adjustable Wrench
—	3-Inch C Screwdriver
—	4-Inch E Screwdriver
—	5-Inch E Screwdriver
—	P Long-Nose Pliers
—	Diagonal Pliers
—	1-Pound Ball Peen Hammer
—	1-Pound Soldering Copper
—	1/8-Inch Pin Punch, L. S. Starrett Co No. 565 or Equivalent
—	Bearing Puller, Owatonna Tool Co No. 1000-1/2-L
<b>MATERIALS</b>	
KS-2423	Cloth
KS-6232	Light Mineral Oil
KS-7860	Petroleum Spirits
—	10-32 Round Head Machine Screw, 1/2 Inch Long
—	Brass or Copper Tubing (see 3.11)

**3.02** On some switches, only the driving mechanism is protected by a cover. To work on the mechanism, remove the cover mounting screws using the 4-inch E screwdriver or R-1542 adjustable wrench and remove the cover. On switches which are entirely protected by a cover, remove the cover by slightly lifting the cover and then pulling it outward.

**3.03** Before doing any work on the switch, make sure that the knife blades are engaged in their top (normal) positions unless otherwise stated in the procedures.

**3.04** *Caution: It is not practicable to remove potential from the knife switches. Live parts should be wrapped with canvas or tape before doing any work. Extreme care should be exercised to avoid a short circuit between the live contacts and other metal parts of the switch. When working on the switch, do not simultaneously touch current-carrying parts and ground with the hands or tools.*

**3.05** After making any replacement of parts, the part or parts replaced shall meet the requirements involved as specified in Section 030-787-701. Other parts whose adjustments may have been disturbed by the replacing operations shall also meet the requirements and an over-all operation check shall be made before restoring the switch to service.

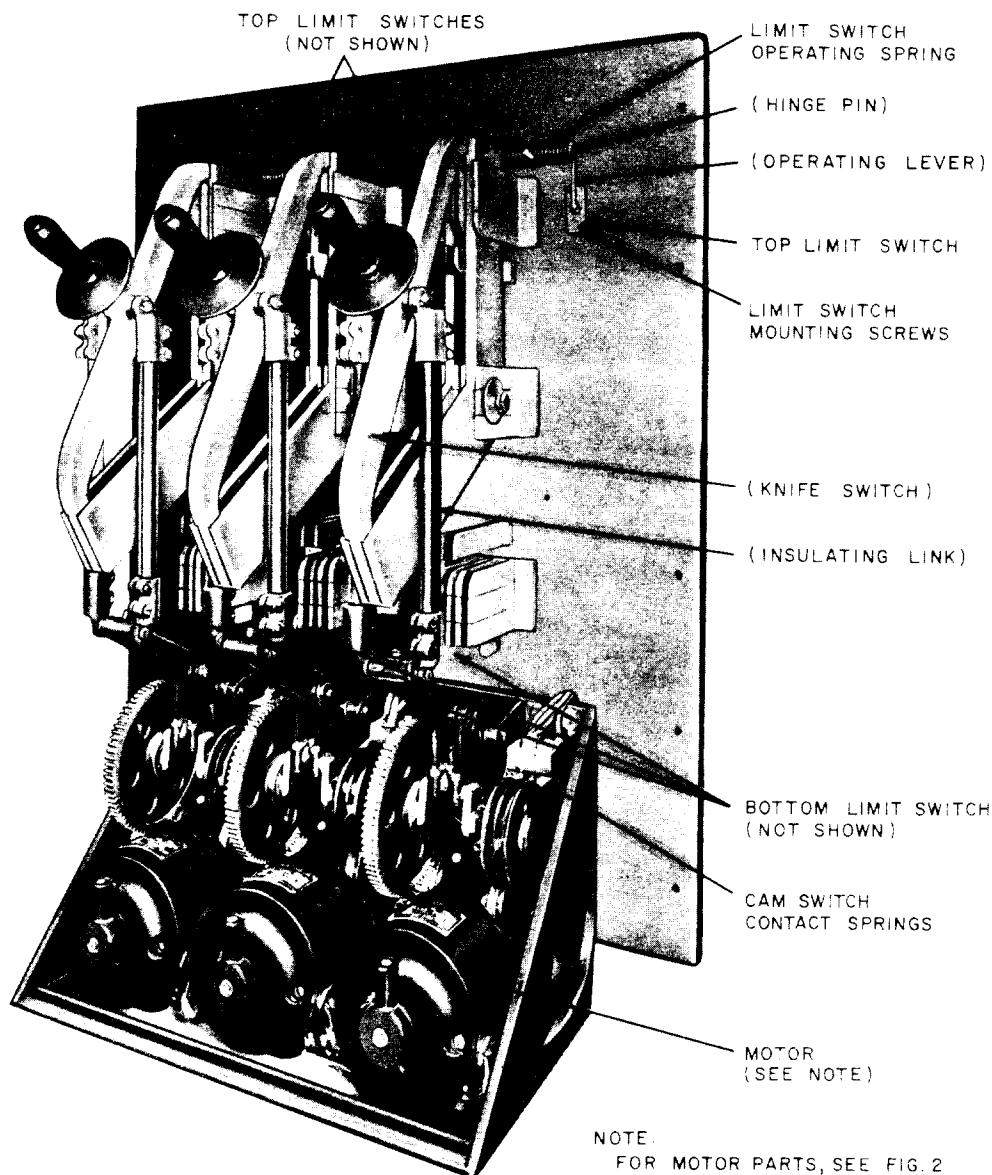
**3.06 Manual Operation of Knife Switches****(1) Operation of Knife Switch from Normal to Emergency Position**

(a) Operate the MAN-AUTO key on the battery control board of the associated plant to MAN. The knife switch that is operated during this procedure is the right end knife switch on the switches covered per SD-81022-02 and SD-81023-02 and the center knife switch for switches covered per SD-81022-01, SD-81023-01, and SD-80577-01.

(b) Disconnect the upper ends of the insulating links from the operating lever of the knife switch as follows. Using the P long-nose pliers, remove one of the cotter pins from the bearing pin through the links and remove the bearing pin. Allow the links to hang temporarily from the rocker arm.

(c) Insert the shaft of the handle furnished with the switch into the hole on the operating lever of the knife switch.

(d) Turn off all the charging units in the associated plant as covered in BSP section for the plant. When the R relay in the emergency cell switch control circuit of the



**Fig. 1—KS-5502 Type Motor-Driven Switch—Front View (Cover Removed)**

plant operates, operate the knife switch to its emergency position.

(2) ***Restoring Knife Switch from Emergency to Normal Position***

(a) Restore the charging units in the associated plant to service. When the L relay in the emergency cell switch control circuit of the plant operates, operate the knife switch to its top position.

***Caution:*** The knife switch should not be operated to the emergency position and returned to normal more often than once every 5 minutes.

(b) Position the upper ends of the insulating links on the operating lever. Remount the bearing pin and secure the cotter pin in the end of the bearing pin using the P long-nose pliers.

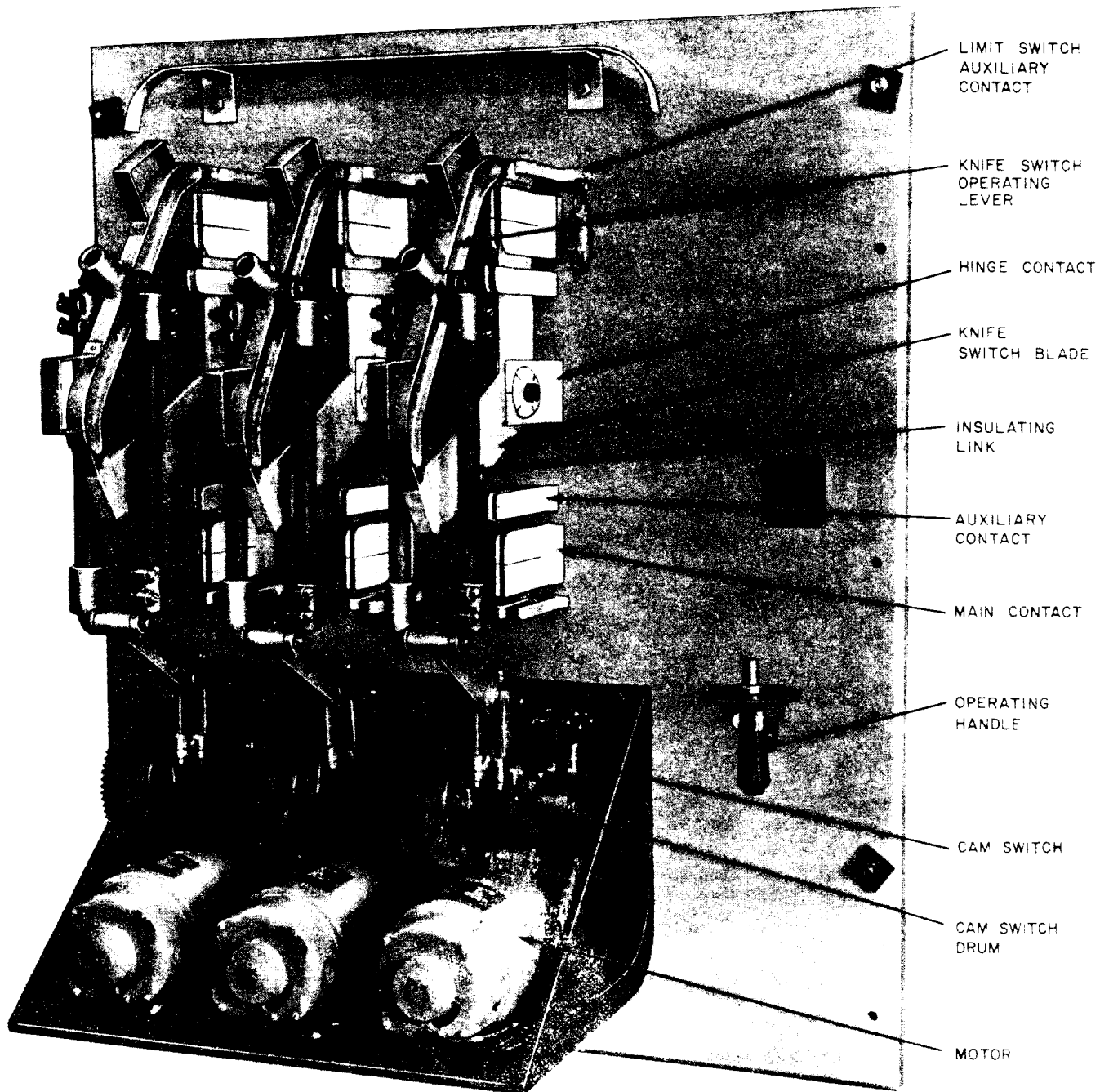
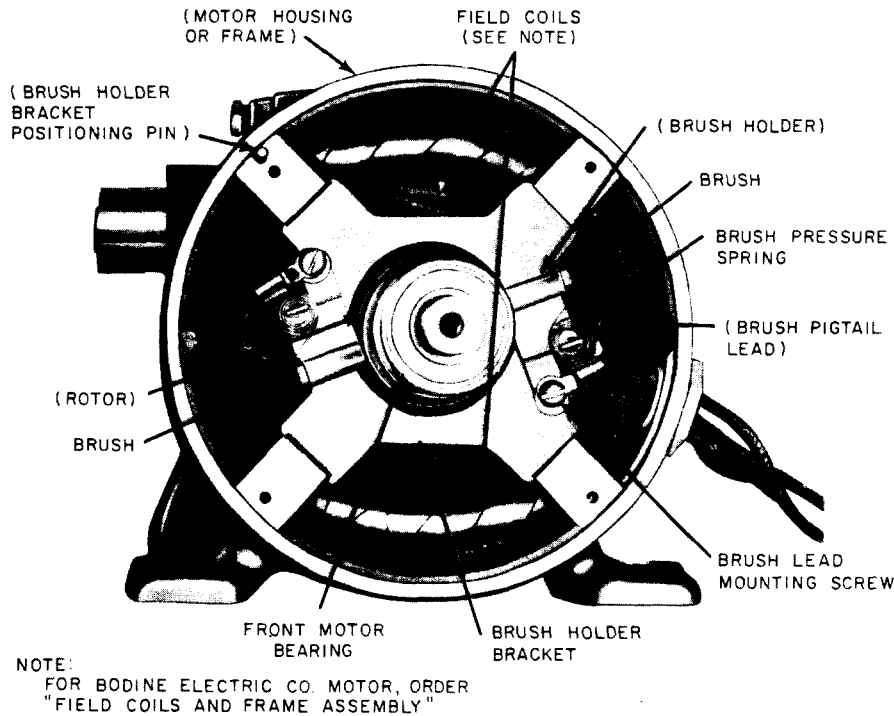


Fig. 2—KS-15836 Type Motor-Driven Switch—Front View (Cover Removed)

(c) Operate the MAN-AUTO key on the battery control board of the plant to AUTO when the work is completed.

(3) Operation of the knife switch from Group 1 to Group 1 and 2 position as covered by SD-80577-01, SD-81022-01, and SD-81023-01. The

knife switch to be operated in the switch on the right side. Operation of the knife switches from position 65A, 65B to position 69A, 69B as covered by SD-81022-02 and SD-81023-02. The knife switches to be operated are the center knife switch and the knife switch on the left side.



**Fig. 3—Motor for KS-5502 and KS-15836 Type Motor-Driven Switches—End Shield Removed (Master Electric Co. motor shown)**

**Caution:** ♦Operation of the knife switch from *FLOAT* position to *CHARGE* position (knife switch on the left side on switches covered by *SD-80577-01*, *SD-81022-01*, and *SD-81023-01*) will affect the plant voltage if CEMF cells are furnished.♦

**Caution:** ♦Switches shall be moved in a continuous motion from the top to the bottom position and when returning to the top position.♦

(a) Make sure that the knife switch covered in 3.06(1)(a) is in its normal or top position. Operate the MAN-AUTO key on the battery control board of the associated plant to MAN.

(b) Turn off the emergency cell trickle charger in the associated plant.

(c) Disconnect the insulating links from the operating levers of the knife switches as covered in 3.06(1)(b).

(d) Insert the shaft of the handle furnished with the switch into the hole on the operating lever of the knife switch to be operated. These knife switches may be operated from either position to the other without disturbing the plant voltage.

(e) When the work is completed, restore the knife switches to their top positions. connect the insulating links as covered in 3.06(2)(b). Turn on the emergency cell trickle charger in the associated plant. Then operate the MAN-AUTO key on the battery control board of the associated plant to AUTO.

**3.07** Care should be exercised when using petroleum spirits in power rooms where there are dc machines, since commutation may be adversely affected by softening of commutator film by the fumes. To avoid the need for burnishing the commutators of dc machines after doing any cleaning called for in this section, provide adequate ventilation. Use the absolute minimum amount of petroleum spirits required for the cleaning operation and keep the container closed when not in use.

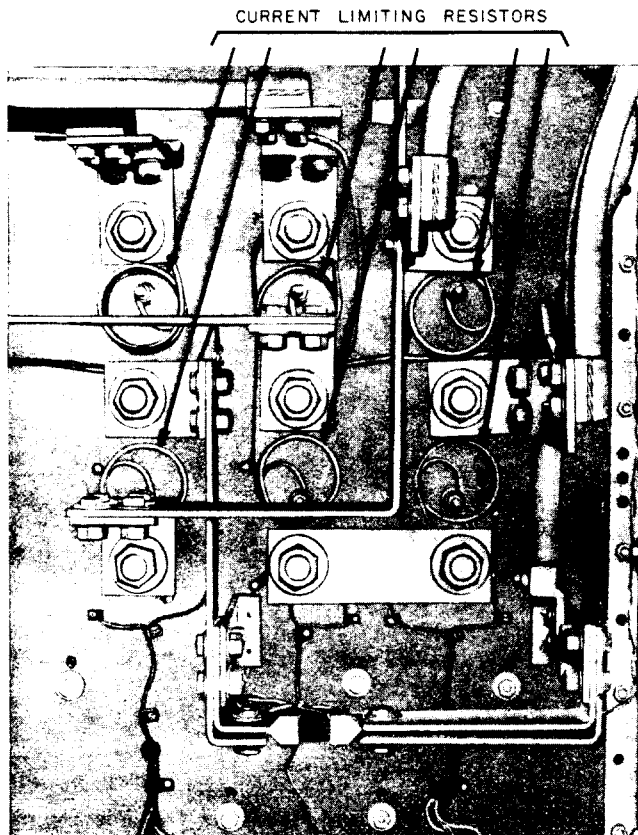


Fig. 4—KS-5502 and KS-15836 Type Motor-Driven Switches—Partial Rear View (KS-15836 L2 switch shown)

**Motor Equipped With Gear Case: Fig. 1, 2, 5, and 6**

**3.08** In order to facilitate replacement of a motor, the motor and gear case are replaced as a unit. Replacement of the unit requires removal of the associated crankshaft assembly. To replace the motor and gear case, proceed as follows:

- (1) Remove one of the cotter pins through the crankshaft link bearing pin using the P long-nose pliers and remove the bearing pin. Support the crankshaft assembly and remove the crankshaft bearing cap mounting screws and lockwashers using the KS-14220 L1 handle, KS-14220 L4 extension, and KS-14220 L16 socket wrench. Remove the bearing caps and shims, if provided, and lay them out for remounting in their original positions. Remove the crankshaft assembly, taking care not to damage the cam

switch contact springs when disengaging them from the cam switch drums.

- (2) Using the handle, extension, and socket wrench with the KS-14220 L5 universal joint, remove the gear case pinion bearing cap mounting screws and lockwashers. Remove the bearing cap and shims, if provided, and lay them out for remounting in their original positions.

- (3) The motor and gear case mounting screws and leveling screws which are adjacent to the rear mounting screws are accessible from underneath the frame. Using the KS-14220 L20 socket wrench with the KS-14220 L1 handle, remove the motor and gear case mounting screws and lockwashers. Loosen the locknuts on the leveling screws and loosen each leveling screw three or four turns with the R-1542 adjustable wrench. Using the 1/8-inch pin punch and the hammer, from underneath the frame, knock out the dowel pins holding the motor in alignment on the frame. Tag the motor leads for reference when connecting the new motor. Disconnect the leads at the lead connectors, if provided, or from the terminal strip at the rear of the switch panel using the 4-inch E screwdriver. Then remove the motor and gear case.

- (4) Position the new motor and gear case unit on the frame so that the mounting holes in the unit line up with the associated holes in the frame. Start the mounting screws in the holes. Since it is impracticable to drill the new motor and gear case unit for the dowel pins, discard the dowel pins.

- (5) Position the crankshaft assembly on the frame so that the cam switch contact springs rest against the depression in the cam switch drums and the crankshaft gear meshes with the pinion on the gear case. Place the lockwashers, crankshaft bearing cap, and shims, if provided, on the screws in that order and mount the caps, securely tightening the screws.

- (6) Check whether the crankshaft gear and pinion mesh properly as follows: Using the 4-inch E screwdriver, pry off the cap, if provided, that covers the end of the motor shaft. Mount the 10-32 screw in the hole in the end of the motor shaft. Hold the free end of the crankshaft link away from adjacent parts to avoid jamming and turn the screw clockwise, thus turning the

pinion and crankshaft gear. Continue turning for at least one revolution of the crankshaft gear. Check for gear bind or excessive play between the gears. If the gear mesh is not satisfactory, adjust the leveling screws as covered in (7). If the gear mesh is satisfactory, securely tighten the mounting screws and locknuts on the leveling screws.

(7) The leveling screws adjacent to the motor and gear case mounting screws at the rear are provided to raise and lower the motor and gear case when required to bring the pinion into proper mesh with the crankshaft gear. If the gears bind, loosen the locknut and turn each leveling screw counterclockwise, as required, using the R-1542 adjustable wrench to lower the pinion. Then securely tighten the mounting screws and locknuts on the leveling screws. If there is excessive play between the gears, loosen the locknut and turn each leveling screw clockwise, as required, to raise the pinion. After obtaining satisfactory gear mesh, securely tighten the mounting screws and locknuts on the leveling screws.

(8) Place the lockwashers, gear case pinion bearing cap, and shims, if provided, on the screws in that order and mount the cap, securely tightening the screws. Line up the holes in the crankshaft link with the hole in the rocker arm, turning the crankshaft, if necessary, as covered in (6). Remount the crankshaft link bearing pin and secure the cotter pin in the end of the bearing pin using the P long-nose pliers. Remove the screw from the end of the motor shaft and remount the cap, if provided, at the end of the motor shaft.

(9) Connect the motor leads to the proper lead connectors or terminals on the switch, referring to Fig. 7 and to the designations on the leads to make sure that the proper connections are made.

#### **Motor Field Coils: Fig. 3**

**3.09** The replacement field coils for the Master motor, Dyna motor, and Brown-Brockmeyer motor are furnished with pole pieces and a complete set of motor leads. Since replacement of the field coils on the Master motor also requires replacement of the motor nameplate, a new nameplate is also furnished for the Master motor. The field coils

for the Bodine motor are furnished as part of the motor housing to facilitate replacement and are also furnished with a complete set of leads. To replace the field coils, remove the motor and gear case as covered in 3.08(1) through (3) without disturbing the adjustment of the leveling screws and place the unit on a work bench. Then proceed as follows:

#### **(1) Master Motor**

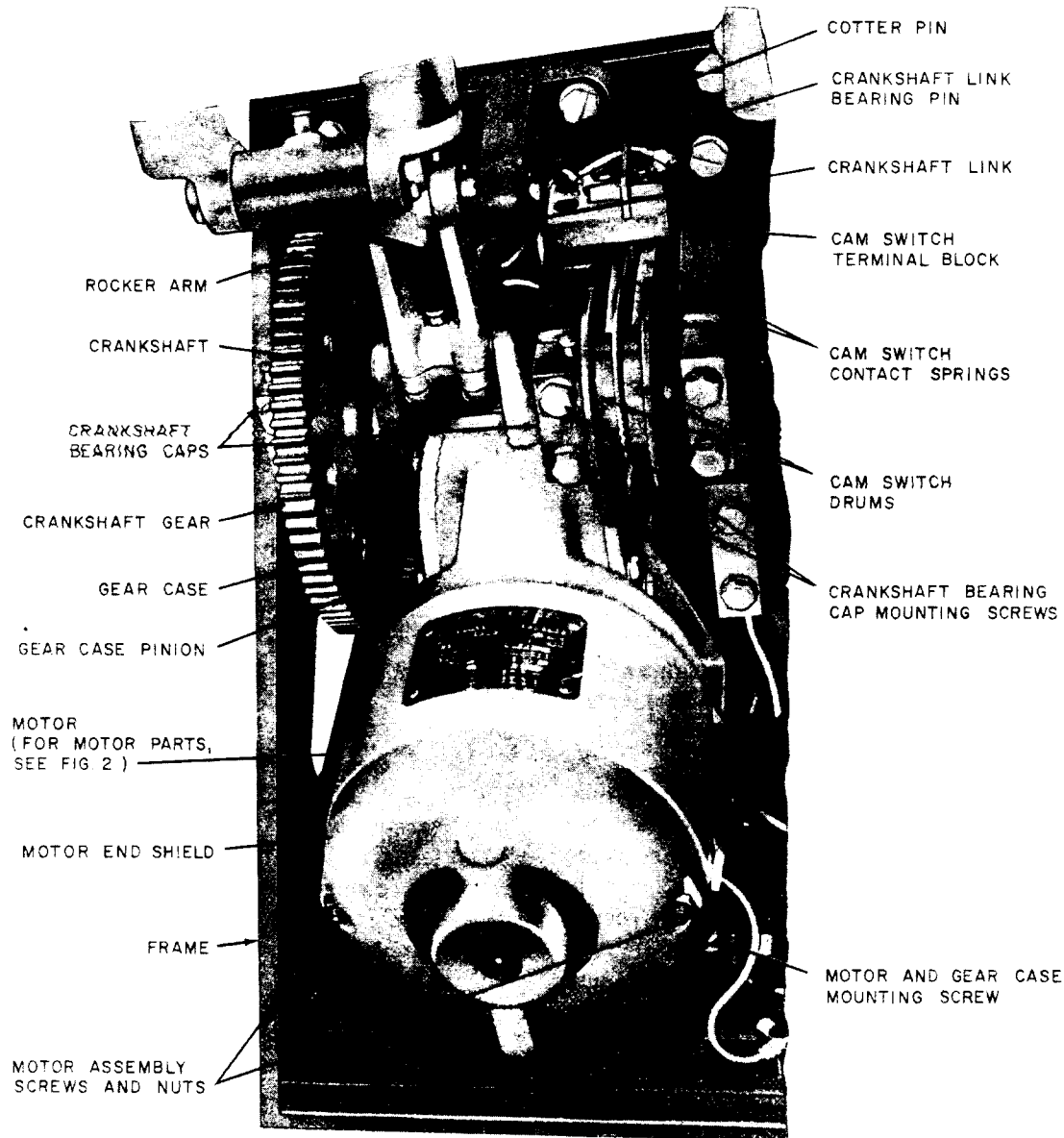
(a) Mark the gear case, motor housing, and end shield for remounting in their original positions. Remove the motor assembly nuts using the KS-14220 L11 or L12 socket wrench with the KS-14220 L1 handle. If necessary, hole the head or nut on the other end of the screw with the P long-nose pliers when removing each nut. Pry the end shield off the motor using the 3-inch C screwdriver. Remove the end play washers, where provided, and lay them out for remounting in their proper order.

(b) Mark the brush holders for reference when connecting the new leads and disconnect the leads using the 3-inch C screwdriver. Then grasp the brush pigtail leads and gently pull the brushes away from the commutator. While holding the brushes in this position, remove the brush holder bracket.

(c) Taking care not to damage the rotor, remove the motor housing. Pry out the escutcheon pins that secure the nameplate to the housing using the diagonal pliers and remove the nameplate. Take care not to lose the pins.

(d) Observe the position of the leads on the field coils with respect to the lead hole in the motor housing or end shield so as to similarly position the new field coils. Then remove the field coil mounting screws using the 5-inch E screwdriver and remove the field coils.

(e) Making sure that the pole pieces are aligned to fit the armature, mount the new field coils, and securely tighten the screws. Insert the tagged ends of the leads through the lead hole in the motor housing



**Fig. 5—Portion of KS-5502 Type Motor-Driven Switch Showing Motor and Crankshaft Assembly**

and pull them as far as possible through the hole.

(f) Mount the new nameplate on the motor housing and tap the escutcheon pins securely into place using the hammer.

(g) Arrange the leads inside the motor housing so that they will not touch the rotor when remounting the housing. Taking care not to

damage the rotor or field coils, remount the housing.

(h) Remount the brush holder bracket so that the slot in the bracket engages the pin on the motor housing and the brushes rest properly against the commutator. Referring to the designations A1 and A2 on the brush leads, connect each brush lead and brush pigtail lead to the associated brush holder terminal and securely tighten the screw.



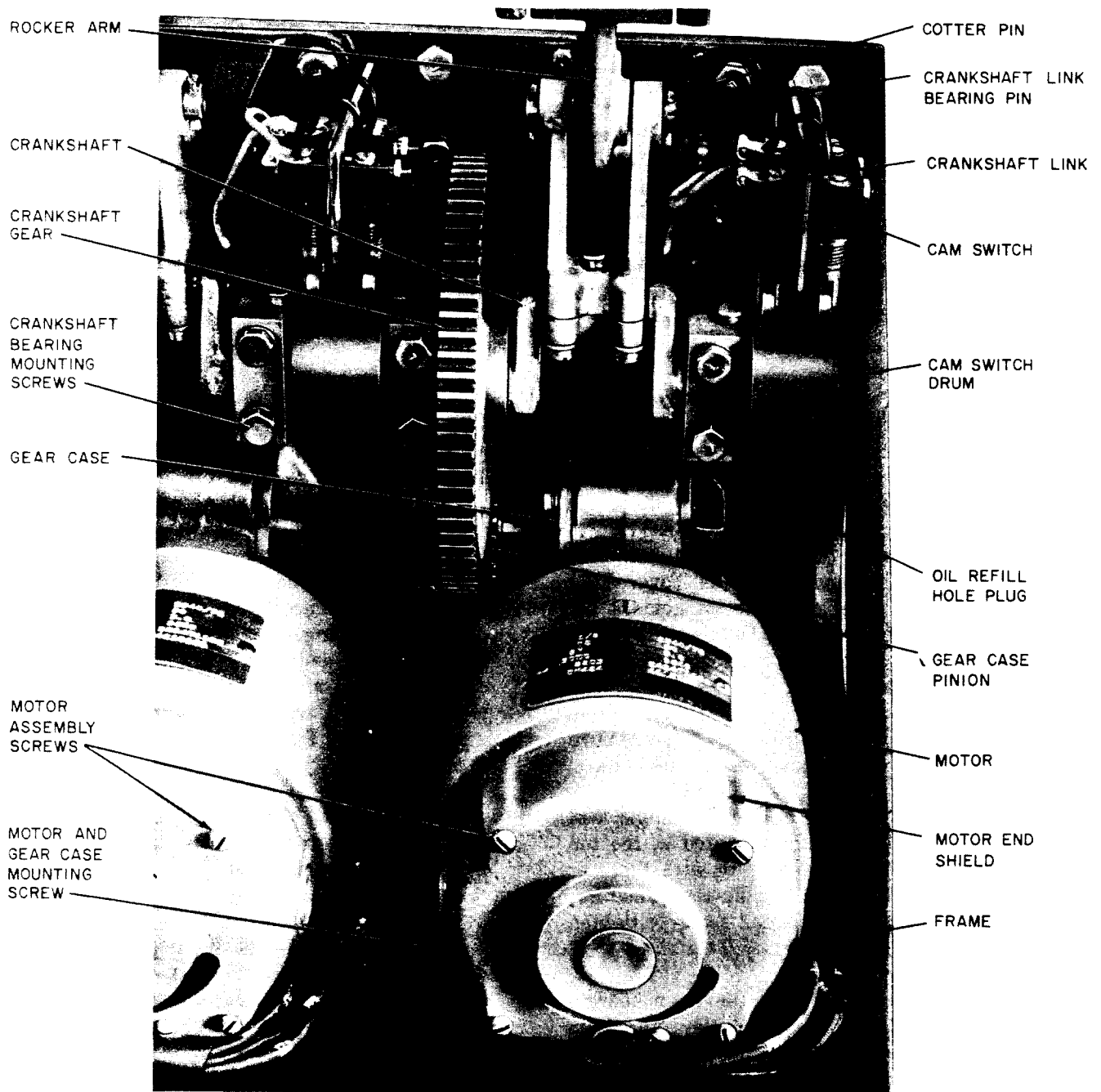


Fig. 6—Portion of KS-15836 Type Motor-Driven Switch Showing Motor and Crankshaft Assembly

(i) Rotate the rotor to make sure it will not touch the pole pieces, field coils, or any of the leads. Place the end play washers in their proper order in the bearing housing in the motor end shield. Then, making sure the pin in the motor housing is engaged by

the slot in the brush holder bracket, mount the end shield and securely tighten the nuts.

(j) Before remounting the motor, make sure that the direction of rotation of the output shaft on the gear case is counterclockwise as

follows. Connect the A1 and F2 leads to a test battery supply approximately equal to the voltage indicated on the motor nameplate. Connect ground to the F1 and A2 leads.

(k) Position the motor and gear case unit on the frame so that the dowel pin holes in the unit line up with the associated holes in the frame. Place the dowel pins in the holes and tap them securely into place using the pin punch and hammer. Start the motor and gear case mounting screws in the mounting holes. Then remount the associated parts and make adjustments, if necessary, in accordance with 3.08(5) through (9).

## (2) *Dyna Motor and Brown-Brockmeyer Motor*

(a) Using the 4-inch E screwdriver, remove the brush caps on the motor end shield and remove the brushes, marking them for remounting in their original positions.

(b) Remove the end shield as covered in 3.09(1)(a). Mark the brush holders for reference when connecting the new leads and disconnect the leads using the soldering copper and P long-nose pliers.

(c) Remove the motor housing. Then remove the field coils as covered in 3.09(1)(d).

(d) The new field coil having the single lead taped to it should be mounted at the top of the motor housing. Making sure that the pole pieces are aligned to fit the armature, mount the new field coils and securely tighten the screws.

(e) Arrange the leads inside the motor housing so that they will not touch the rotor when remounting the housing. Taking care not to damage the rotor or field coils, remount the housing.

(f) Insert the tagged ends of the new leads through the lead hole in the motor end shield and pull them as far as possible through the hole without remounting the end shield. Referring to the marks on the brush holders and the designations A1 and A2 on the brush leads, solder each brush lead to the associated brush holder terminal in accordance with approved procedures.

(g) Rotate the rotor to make sure it will not touch the pole pieces, field coils, or any of the leads. Place the end play washers in their proper order in the bearing housing in the motor end shield. Then remount the end shield and securely tighten the nuts.

(h) Remount the brushes and brush caps. Take care not to excessively tighten the caps to avoid splitting them.

(i) Check for counterclockwise rotation of the output shaft and remount the motor and gear case in accordance with 3.09(1)(j) and (k).

## (3) *Bodine Motor*

(a) Using the 4-inch E screwdriver, remove the brush caps on the motor end shield and remove the brushes, marking them for remounting in their original positions.

(b) Mark the end shield and motor housing for reference when remounting the end shield. Using the 4-inch E screwdriver, remove the end shield mounting screws and pry the end shield off the motor. Remove the end play washers, where provided, and lay them out for remounting in their proper order.

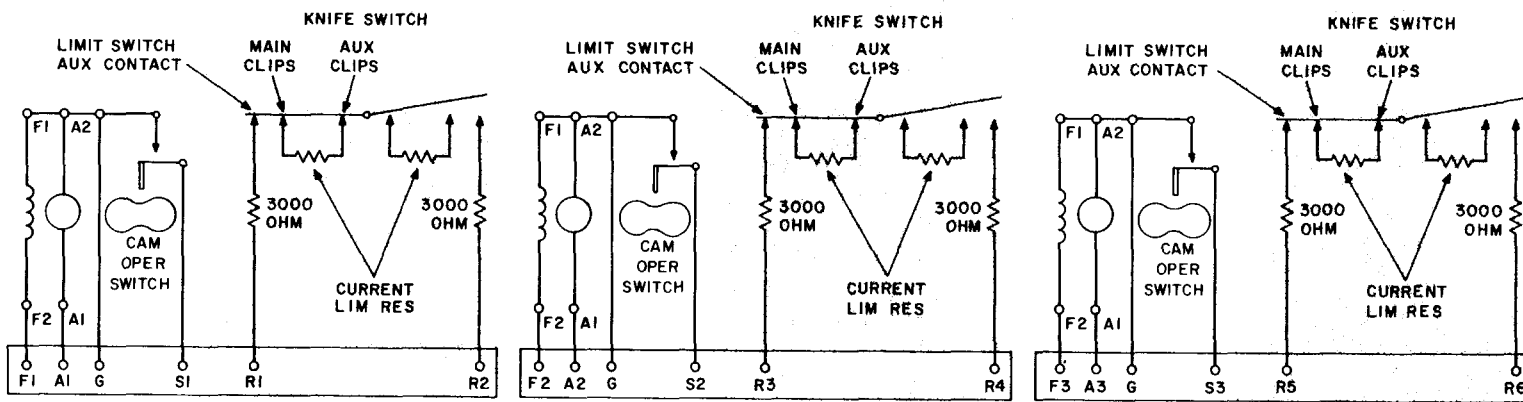
(c) Mark the brush holders for reference when connecting the new leads and disconnect the leads using the soldering copper and P long-nose pliers.

(d) Using the 4-inch E screwdriver or, if necessary, the 207 offset screwdriver, remove the motor housing mounting screws at the rear of the motor and remove the housing, taking care not to damage the rotor.

(e) Pry out the escutcheon pins that secure the nameplate to the motor housing using the diagonal pliers and remove the nameplate. Take care not to lose the pins.

(f) Mount the nameplate on the new housing and field coil assembly and tap the escutcheon pins into place using the hammer.

(g) Position the housing and field coil assembly so that the leads are at the front and



REAR VIEW

NOTE:  
THE WIRING SHOWN IN SHADED AREAS APPLIES  
TO KS-15836 SWITCH ONLY.

Fig. 7—Schematic Showing Wiring Connections for Motors and Cam Switches

mount the housing and securely tighten the screws.

(h) Insert the tagged ends of the leads through the lead hole in the motor end shield and pull the leads as far as possible through the hole without remounting the end shield. Referring to the marks on the brush holders and the designations A1 and A2 on the brush leads, solder each brush lead to the associated brush holder terminal in accordance with approved procedures.

(i) Rotate the rotor to make sure it does not touch the pole pieces, field coils, or any of the leads. Place the end play washers in their proper order in the bearing housing in the motor end shield. Then remount the end shield and securely tighten the screws.

(j) Remount the brushes and brush caps. Take care not to tighten the caps excessively to avoid splitting them.

(k) Check for counterclockwise rotation of the output shaft and remount the motor and gear case in accordance with 3.09(1)(j) and (k).

#### Motor Brushes

3.10 To replace a brush, proceed as follows:

(1) ***Bodine Motor, Brown-Brockmeyer Motor, and Dyna Motor***

(a) Remove the brush holder cap on the motor end shield using the 4-inch E screwdriver and remove the brush.

(b) Position the new brush in the brush holder with the spring outermost. Then compress the spring and remount the brush cap. Take care not to tighten the cap excessively to avoid splitting it.

(2) ***Master Motor: Fig. 3***

(a) Remove the motor end shield as covered in 3.09(1)(a).

(b) Using the 3-inch C screwdriver, remove the brush lead mounting screw and disconnect the leads. Move the end of the

brush spring out of the holder using the KS-6320 orange stick and remove the brush.

(c) Position the new brush in the holder and position the end of the spring so that it presses against the brush. Connect the leads and securely tighten the screw.

(d) Place the end play washers in their proper order in the bearing housing in the motor end shield. Then, making sure that the slot in the brush holder bracket engages the pin on the motor housing and that the brushes rest properly against the commutator, remount the end shield and securely tighten the nuts.

#### Motor Bearing: Fig. 3

3.11 To replace the bearing at the front of the motor, proceed as follows:

(1) ***Bodine Motor, Brown-Brockmeyer Motor, and Dyna Motor***

(a) Using the 4-inch E screwdriver, remove the brush caps and remove the brushes, marking them for remounting in their original positions.

(b) Remove the end shield as covered in 3.09(3)(b) for Bodine motor and 3.09(1)(a) for the Brown-Brockmeyer or Dyna motor and allow the end shield to hang temporarily on the leads.

(c) Using the Owatonna bearing puller, remove the bearing.

(d) Clean the shaft and the bearing housing in the motor end shield with a clean KS-2423 cloth moistened with KS-7860 petroleum spirits. Wipe dry with a clean, dry cloth.

(e) Start the new bearing on the shaft. Position the tube which just fits over the shaft so that it engages the inner race of the bearing. Using the hammer, gently tap the tube to position the bearing on the shaft.

(f) Wipe the bearing housing in the motor end shield with a clean KS-2423 cloth moistened with KS-6232 oil. Place the end play washers in their proper order in the

bearing housing. Then remount the end shield and securely tighten the screws or nuts.

(g) Remount the brushes and brush caps. Take care not to tighten the caps excessively to avoid splitting them.

(2) **Master Motor**

(a) Remove the motor end shield as covered in 3.09(1)(a).

(b) Replace the bearing in accordance with 3.11(1)(c) through (e).

(c) Wipe the bearing housing in the motor end shield with a clean KS-2423 cloth moistened with KS-6232 oil. The remount the end shield as covered in 3.10(2)(d).

**Limit Switches: Fig. 1**

**3.12 KS-5502 Motor-Driven Switch:** Replacement of a limit switch requires removal of the associated operating spring. To replace a limit switch, proceed as follows:

(1) If necessary, operate the associated knife switch in accordance with 3.06 to the position opposite that of the limit switch to be replaced in order to release the operating spring.

(2) To gain access to an operating spring and limit switch at the bottom, disconnect the insulating links from the associated knife switch as covered in 3.06(1)(b). Then, using the P long-nose pliers, remove one of the cotter pins through the crankshaft link bearing pin, remove the bearing pin, and disconnect the link. Move the rocker arm and insulating links downward.

(3) Using the P long-nose pliers, remove the cotter pin in the end of the hinge pin which secures the operating spring, remove the hinge pin, and remove the spring.

(4) Using the 3-inch C screwdriver, remove the limit switch mounting screws. Pull the limit switch out from the panel sufficiently to gain access to the lead mounting screws. Then, disconnect the leads using the screwdriver and remove the limit switch.

(5) Connect the leads to the new limit switch and mount the switch, securely tightening the screws.

(6) Position the limit switch operating spring on its mounting bracket so that the operating lever rests against the limit switch plunger and the actuating lever is between the contact clips. While holding the spring in this position, mount the hinge pin and secure the cotter pin using the P long-nose pliers.

(7) If the crankshaft link and insulating links were disconnected, line up the holes in the crankshaft link with the hole in the rocker arm. Remount the crankshaft link bearing pin and secure the cotter pin in the end of the bearing pin using the P long-nose pliers. Then line up the holes in the free end of the insulating links with the hole in the operating lever. Remount the bearing pin and secure the cotter pin in the end of the bearing pin using the P long-nose pliers.

(8) If the associated knife switch was operated, restore the knife switch to its original position in accordance with 3.06.

**Limit Switch Operating Spring: Fig. 1**

**3.13 KS-5502 Motor-Driven Switch:** To replace a limit switch operating spring, proceed as follows:

(1) If necessary, operate the associated knife switch in accordance with 3.06 to the position opposite that associated with the operating spring to be replaced in order to release the spring.

(2) Remove the operating spring in accordance with 3.12(2) and (3).

(3) Mount the new operating spring in accordance with 3.12(6) and (7).

(4) If the associated knife switch was operated, restore the knife switch to its original position in accordance with 3.06.

**Cam Switch Contact Springs: Fig. 1 and 5**

**3.14** To replace the cam switch contact springs, proceed as follows:

- (1) Using the 4-inch E screwdriver, remove the cam switch terminal block mounting screws. Taking care not to damage the leads, lift the block and contact springs away from the cam switch drums and turn the block to gain access to the contact spring mounting screws. Remove the mounting screws and remove the springs.
- (2) Mount the new contact springs on the terminal block and securely tighten the screws. Make sure that the springs properly engage the cam switch drums and mount the terminal block, securely tightening the screws.

**Current Limiting Resistors: Fig. 4**

**3.15** Replacement of a current limiting resistor may require that the switch be disconnected from the power supply. This matter should be referred to the supervisor since the switch must be temporarily shunted with a cable or bus bar of adequate capacity to maintain the office load before disconnecting the switch.

**Cam Switch Drums: Fig. 5 and 6**

**3.16** To replace the cam switch drum assembly, proceed as follows:

- (1) Make sure that the all knife switches are in their top or uppermost position. Remove

motor fuse and control circuit fuse for the switch from the battery control board of the associated plant.

- (2) Remove crankshaft bearing cap mounting screws. For 200 amp switches use the 7/16-inch hex socket wrench. For 600 and 1200 amp switches use the 1/2-inch hex socket wrench.

- (3) Grasp crankshaft drive gear at the top and pull away from panel, working the bearing caps out of the notched recesses in main frame casting. Use care not to overstress or bend crankshaft or damage cam switch contact springs. The crankshaft and cam switch drum assembly will then swing forward secured only by the connecting rod.

- (4) Using long-nose pliers, remove brass cotter pin at right end of crankshaft to permit removal of cam switch drum assembly. Do not lose Woodruff key which positions cam drums on crankshaft.

- (5) Remove drum assembly.

- (6) Install new drum assembly by reversing the removal procedure.

- (7) Replace the motor fuse and control circuit fuse.